

(19) World Intellectual Property Organization  
International Bureau



(43) International Publication Date  
21 December 2000 (21.12.2000)

PCT

(10) International Publication Number  
**WO 00/77860 A2**

(51) International Patent Classification<sup>7</sup>: H01L 31/00

(21) International Application Number: PCT/GB00/02159

(22) International Filing Date: 14 June 2000 (14.06.2000)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:  
9913705.1 14 June 1999 (14.06.1999) GB

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(81) Designated States (national): AE, AG, AL, AM, AT, AU,  
AZ, BA, BB, BG, BR, BY, CA, CH, CN, CR, CU, CZ, DE,  
DK, DM, DZ, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU,  
ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS,  
LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO,  
NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR,  
TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW.

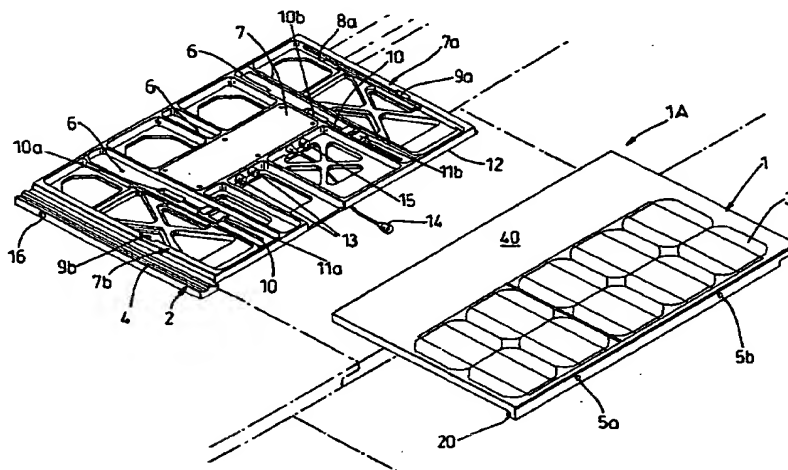
(84) Designated States (regional): ARIPO patent (GH, GM,  
KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW), Eurasian  
patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European  
patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE,  
IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG,  
CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

Published:

— Without international search report and to be republished  
upon receipt of that report.

[Continued on next page]

(54) Title: SOLAR TILE ASSEMBLY



(57) Abstract: A solar tile assembly (1A) comprises a removable rectangular outer panel (1) that comprises ten photovoltaic cells (3) disposed on the outermost surface thereof, and a substantially rectangular inner support structure (2). The photovoltaic cells (3) cover the lower portion of the outer panel (1). Any suitable photovoltaic means may be used for the solar tile assembly. The outer panel (1) is secured to the inner support structure (2) using two fasteners (5a, 5b) disposed at the front end of the solar tile assembly (1A). The fasteners (5a, 5b) may typically be quarter or half turn captive fasteners. These types of fasteners have the added advantage of being retained by the outer panel (1) during assembly/disassembly processes. The inner support structure (2) comprises a framework at one end of which there is formed a lower stepped interlockable section (4). In use the interlockable section (4) is disposed under a portion of an adjacent tile assembly, as is well known in the art of roof tile design.

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## SOLAR TILE ASSEMBLY

The present invention relates to a solar tile assembly and is concerned particularly with a two part solar roofing tile and a method for providing electrical connection between the respective parts of the two part solar  
5 roofing tile.

It is known to use solar panels comprising photovoltaic modules that may be placed onto the exterior of a building or replace the existing roof tiles. Examples of such photovoltaic modules are described in US 5590495, US 5112408 and EP 0710806. The photovoltaic modules systems  
10 normally comprise a plurality of solar panels that are electrically connected to form a circuit. The solar panels may require routine maintenance that necessitates the removal of one or more of the solar panels.

According to a first aspect of the present invention there is provided a  
15 solar tile assembly comprising a removable outer panel that comprises photovoltaic means and a first electrical connector, and an inner support structure that comprises a second electrical connector, the arrangement being such that in use an electrical connection between the first electrical connector and the second electrical connector is achieved by bringing  
20 together the outer panel and the inner support structure.

The electrical connection between the first electrical connector and the second electrical connector is preferably broken by the removal of the outer panel from the inner support structure.

Preferably, the outer panel is slidably attached to the inner support  
25 structure by attachment means comprising a channel section formed to receive an attachment element.

Preferably, the outer panel comprises the attachment element and the inner support structure is formed with the channel for receiving and retaining the attachment element of the outer panel.

5 The outer panel conveniently comprises a pair of attachment elements and the inner support structure is formed with a pair of channels for receiving and retaining the attachment elements of the outer panel.

The electrical connection between the first electrical connector and the second electrical connector is preferably broken by sliding the outer panel in a direction that is substantially parallel to plain of outermost surface of the outer panel.

10

Preferably the outer panel is removed from the inner support structure by first sliding the outer panel in a direction that is substantially parallel to plain of outermost surface of the outer panel and then lifting the outer panel in a direction perpendicular to the direction of the slide direction.

15 In use the inner support structure can be attached to the outer surface of a structure such as a building. If necessary a damaged outer panel can be easily removed from the solar tile assembly whilst still leaving the inner support structure fixed to the building. A new outer panel can then replace the damaged outer panel. Also, the outer panel and the inner support structure can be easily inspected by removing the outer panel.

20

The inner support structure preferably comprises an electrical junction box comprising the second electrical connector.

The electrical junction box of the inner support structure preferably comprises an electrical input terminal and an electrical output terminal, the arrangement being such that the electrical input terminal and the

25

electrical output terminal provide electrical communication between corresponding solar tile assemblies. In use the photovoltaic means of the respective solar assemblies generate electrical energy and there may be an electrical network provided between the plurality of solar tile assemblies.

It is preferable that the outer panel comprises an electrical junction box formed with the first electrical connector, the arrangement being such that in the assembled state of the solar tile assembly the first connector and the second connector provide electrical communication between the two electrical junction boxes.

The solar tile assemblies may be conveniently fixed to roof battens of a conventional roof structure and may replace the roofing tiles.

According to an embodiment of the first invention the support structure comprises means for providing electrical connections between adjacent solar tile assemblies.

The means for providing electrical connections between adjacent solar tile assemblies preferably comprises an electrical connector on opposite sides of the support structure.

According to a second aspect of the present invention there is provided a removable solar tile comprising photovoltaic means and an electrical connector, the arrangement being such that in use an electrical connection between the electrical connector of the removable solar tile and a second electrical connector of an inner support structure is achieved by the bringing together of the outer panel and the inner support structure.

According to a third aspect of the present invention there is provided an inner support structure for a removable tile comprising photovoltaic means, the inner support structure comprising an electrical connector, the arrangement being such that in use an electrical connection between the  
5 electrical connector of the inner support structure and an electrical connector of the removable tile is achieved by the bringing together of the removable tile and the inner support structure.

According to a fourth aspect of the present invention there is provided a method for providing an electrical connection for a solar tile assembly  
10 comprising a removable outer panel that comprises photovoltaic means and a first electrical connector, and an inner support structure that comprises a second electrical connector, the method comprises sliding the outer panel towards the inner support structure in a direction substantially parallel to the plane of the outer panel until the first  
15 electrical connector contacts the second electrical connector.

Preferably the electrical connection between the respective parts of the solar tile assembly is broken by sliding the outer panel in the opposite direction.

The invention may include any combination of the features or limitations  
20 referred to herein.

The invention can be put into practice in various ways, but an embodiment will now be described by way of example only with reference to the accompanying drawings in which:

Figure 1 is an isometric view of a solar tile assembly in a closed  
25 assembled condition;

Figure 2 is an isometric view of the solar tile assembly shown in Figure 1 and shows the assembly in a partially open condition;

5 Figure 3 is an isometric view of the solar tile assembly shown in Figure 1 and shows the outer panel separated from the inner support frame;

Figure 4 is an isometric view of the solar tile assembly shown in Figure 1 and shows the outer panel removed from the inner support frame; and

10 Figure 5 is an isometric view of the solar tile assembly shown in Figure 1 and shows more detail of a variable gauge clip, more detail of the outer panel structure and three partial cut-away sections of the outer panel.

With reference to the Figures 1 to 5, a solar tile assembly 1A comprises a removable rectangular outer panel 1 that comprises ten photovoltaic  
15 cells 3 disposed on the outermost surface thereof, and a substantially rectangular inner support structure 2. The photovoltaic cells 3 cover the lower portion of the outer panel 1. Any suitable photovoltaic means may be used for the solar tile assembly.

20 The outer panel 1 is secured to the inner support structure 2 using two fasteners 5a, 5b disposed at the front end of the solar tile assembly 1A. The fasteners 5a, 5b may typically be quarter or half turn captive fasteners. These types of fasteners have the added advantage of being retained by the outer panel 1 during assembly/disassembly processes.

25 The inner support structure 2 comprises a framework at one of which there is formed a lower stepped interlockable section 4. In use the

interlockable section 4 is disposed under a portion of an adjacent tile assembly, as is well known in the art of roof tile design. The inner support structure 2 is formed with three sets of holes 6. These holes 6 allow fixing nails or screws to be used to attach the inner structure 2 to roof tiling battens located underneath the inner structure 2. For certain roof designs no fixing nails or screws will be needed to hold the tile assembly 1A onto the roof. Disposed within the frame of the support structure 2 there is an electrical junction box 7. The inner support structure 2 comprises two parallel end members 7a, 7b (shown in Figures 3 to 5). Formed within each of the respective end members 7a, 7b there are respective slide channels 8a, 8b. At one end of the slide channel 8a there is formed a cutaway access port 9a. At the corresponding end of the slide channel 8b (not shown) there is formed a cutaway access port 9b.

The outer panel 1 comprises a pair of attachment elements 17a, 17b fixed to the inner surface of the outer panel 1 (see Figure 5). The attachment elements 17a, 17b are a triangular wedge shape. A heel portion 17c extends from each of the respective vertical faces of the wedge shapes. The attachment elements 17a, 17b are shaped to be received by the access ports 9a, 9b.

Also formed in the inner support structure 2 there are two substantially parallel channels 10 (shown in Figures 4 and 5). At one end of each channel 10 there is provided an access port 10a, 10b. Each port 10a, 10b has a greater width than the width of the remaining portions of the respective channels 10. The ports 10a, 10b provide access to the channels 10 for two variable gauge clips 11a, 11b.

It will be appreciated by the skilled person in the art that the channels 10 may be used in place of the slide channels 8a, 8b. Channels 10 can



operate to perform the function of channels 8a, 8b by comprising two sets of slide fixtures, one set being attached to the outer panel 1.

Should added retention for the solar tile assembly be required, for example in high winds, the clips 11a, 11b may slide along the channels 10 and are used to fix the outer panel 1 to an outer panel of an adjacent solar panel assembly located below.

The electrical junction box 7 of the inner support structure 2 comprises a pair of electrical connectors 13, an electrical output lead 14 and an electrical input connector 15. The outer panel 1 comprises an electrical junction box 19 that comprises a pair of electrical connectors 19a. In the assembled closed condition of the solar tile assembly 1A (as shown in Figure 1) the electrical connectors 13 are in electrical contact with the electrical connectors 19a.

To disassemble the solar tile assembly 1A the outer panel 1 is first slid in a direction Z and this causes a break in the electrical connection between the connectors 13 and the connectors 19a. The outer panel 1 is slid in the direction Z until the attachment elements 17a, 17b abut the respective lowermost ends of the channels 10. The outer panel 1 will stay in this position without sliding completely off the support structure 2 (as shown in Figure 2). In order to separate the outer panel 1 from the inner support structure 2 the outer panel 1 is moved back a small distance in the opposite direction to direction Z until the attachment elements 17a, 17b align with the respective access ports 9a, 9b. The outer panel 1 can then be lifted away from the inner support structure 2 (as shown in Figure 3).

When the solar tile assembly 1A is reassembled and the outer panel 1 is slid back up into position, the inwardly-extending lip 20 on the front

underside of the outer panel 1 fits under a recess 12 that is formed in the lowermost edge of the inner support structure 2 so providing secure anchorage against high wind.

5 The outer panel 1 is constructed typically of two planar sheets of material (see Figure 5). The uppermost sheet is a transparent material 22a that permits sunlight to reach the photovoltaic elements. In the embodiment shown, the uppermost sheet 22a is larger on three sides than the lowermost sheet 22b and all the fixing arrangements are mounted underneath and inside this area. Hence, no joints exist which could  
10 cause water ingress when exposed to the weather. The materials that may be used for the construction of the parts of the solar tile assembly 1A include metallic or non-metallic including plastics, glass, metal and ceramics/clay/cement.

The underside of the inner support structure 2 has location points to  
15 allow it to be easily positioned on the roof of a building and also to retain it in position whilst fixing down. The variable gauge clips 11a, 11b may be used to fix the outer panel 1 to a tile assembly located in a row below, should added retention be required for example in high wind speed areas.

20 The electrical connection between the outer panel 1 and the inner support structure 2 of the solar tile assembly 1A is made as the outer panel 1 is assembled onto the inner support structure 2. The electrical connection between the outer panel 1 and the inner support structure 2 of the solar tile assembly 1A is broken as the outer panel 1 is disassembled from the  
25 inner support structure 2.

It will be noted by those skilled in the art that electrical connection between the outer panel 1 and the inner support structure 2 can be broken

without the complete separation of the parts because the outer panel 1 has a sliding arrangement with the inner support structure 2.

When the solar tile assembly 1A is assembled, the electrical connection between the connectors 13 and the connectors 19a is retained by use of fasteners 5a, 5b located on the front edge of the outer panel 1. When the fasteners 5a, 5b are undone and outer panel 1 is released the electrical connection will be broken as the outer panel 1 slides in direction Z. When the outer panel 1 stops at the lower part of the channels 10 the junction box 7 will be exposed, therefore allowing access to all necessary electrical components.

Flying leads 14 may be used to connect adjacent solar tile assemblies together to complete a circuit. Fixed connections 16 may also be used on the sides of the inner support structure 2 such that as a solar tile assembly is positioned adjacent to another solar tile assembly, an electrical connection can be made because the two parts of the connector 16 (male and female) are integral with the parts of adjacent tiles assemblies.

As a row of tile assemblies is completed in the horizontal plane and the next row started, a cable would normally have to run from the end of the last row along the roof to the start of the second row. This uses a considerable amount of cable and therefore incurs electrical losses. An alternative arrangement may be made where the wiring of the connections is reversed in alternate rows. The end tile assembly can then be directly connected with a short wire to the next row above or below. In order to distinguish between the tile assemblies with the two types of wiring, the inner support structure 2 of the tile assembly may be colour coded so that during assembly it is easy to lay alternative rows with the correct wiring arrangement.

The dimensions of the solar panel assembly 1A can be made to correspond with the dimensions of conventional roof tiles. Hence, the solar tile assembly can be easily fitted onto an existing roof. The roof may be partially covered by an array of solar tile assemblies and partially  
5 covered by conventional roof tiles. Due to the construction and configuration of the solar tile assembly 1A, the outer panel 1 of an assembly 1A can be removed from the array of assemblies without disturbing the other assemblies.

When there is an array of assemblies, the upper portion 40 of the outer  
10 panel 1 that is not formed with photovoltaic cells 3 because this area is normally covered by a lower portion of an upper adjacent solar tile assembly.

It will be appreciated that the solar tile assembly can be attached to any suitable structure outside or inside a building.

**CLAIMS**

1. A solar tile assembly comprising a removable outer panel that comprises photovoltaic means and a first electrical connector, and an inner support structure that comprises a second electrical connector, the arrangement being such that in use an electrical connection between the first electrical connector and the second electrical connector is achieved by bringing together the outer panel and the inner support structure.
2. A solar tile assembly as claimed in claim 1, wherein the electrical connection between the first electrical connector and the second electrical connector is broken by the removal of the outer panel from the inner support structure.
3. A solar tile assembly as claimed in claim 1 or claim 2, wherein the outer panel is slidably attached to the inner support structure by attachment means comprising a channel section formed to receive an attachment element.
4. A solar tile assembly as claimed in claim 3, wherein the outer panel comprises the attachment element and the inner support structure is formed with the channel for receiving and retaining the attachment element of the outer panel.
5. A solar tile assembly as claimed in claim 3, wherein the outer panel comprises a pair of attachment elements and the inner support structure is formed with a pair of channels for receiving and retaining the attachment elements of the outer panel.
6. A solar tile assembly as claimed in claim 1, wherein the electrical connection between the first electrical connector and the second electrical

connector is broken by sliding the outer panel in a direction that is substantially parallel to plain of outermost surface of the outer panel.

7. A solar tile assembly as claimed in any one of claims 1 to 6, wherein the outer panel is removed from the inner support structure by first sliding the outer panel in a direction that is substantially parallel to plain of outermost surface of the outer panel and then lifting the outer panel in a direction perpendicular to the direction of the slide direction.

8. A solar tile assembly as claimed in any one of the preceding claims, wherein, in use, the inner support structure can be attached to the outer surface of a structure such as a building or attached to an independent support structure inside or outside a building.

9. A solar tile assembly as claimed in any one of the preceding claims, wherein the inner support structure comprises an electrical junction box that comprises the second electrical connector.

10. A solar tile assembly as claimed in claim 9, wherein the electrical junction box of the inner support structure comprises an electrical input terminal and an electrical output terminal, the arrangement being such that the electrical input terminal and the electrical output terminal provide electrical communication between corresponding solar tile assemblies.

11. A solar tile assembly as claimed in claim 9 or claim 10, wherein the outer panel comprises an electrical junction box formed with the first electrical connector, the arrangement being such that in the assembled state of the solar tile assembly the first connector and the second connector provide electrical communication between the two electrical junction boxes.

12. A solar tile assembly as claimed in any one of the preceding claims, wherein the support structure comprises means for providing electrical connections between adjacent solar tile assemblies.

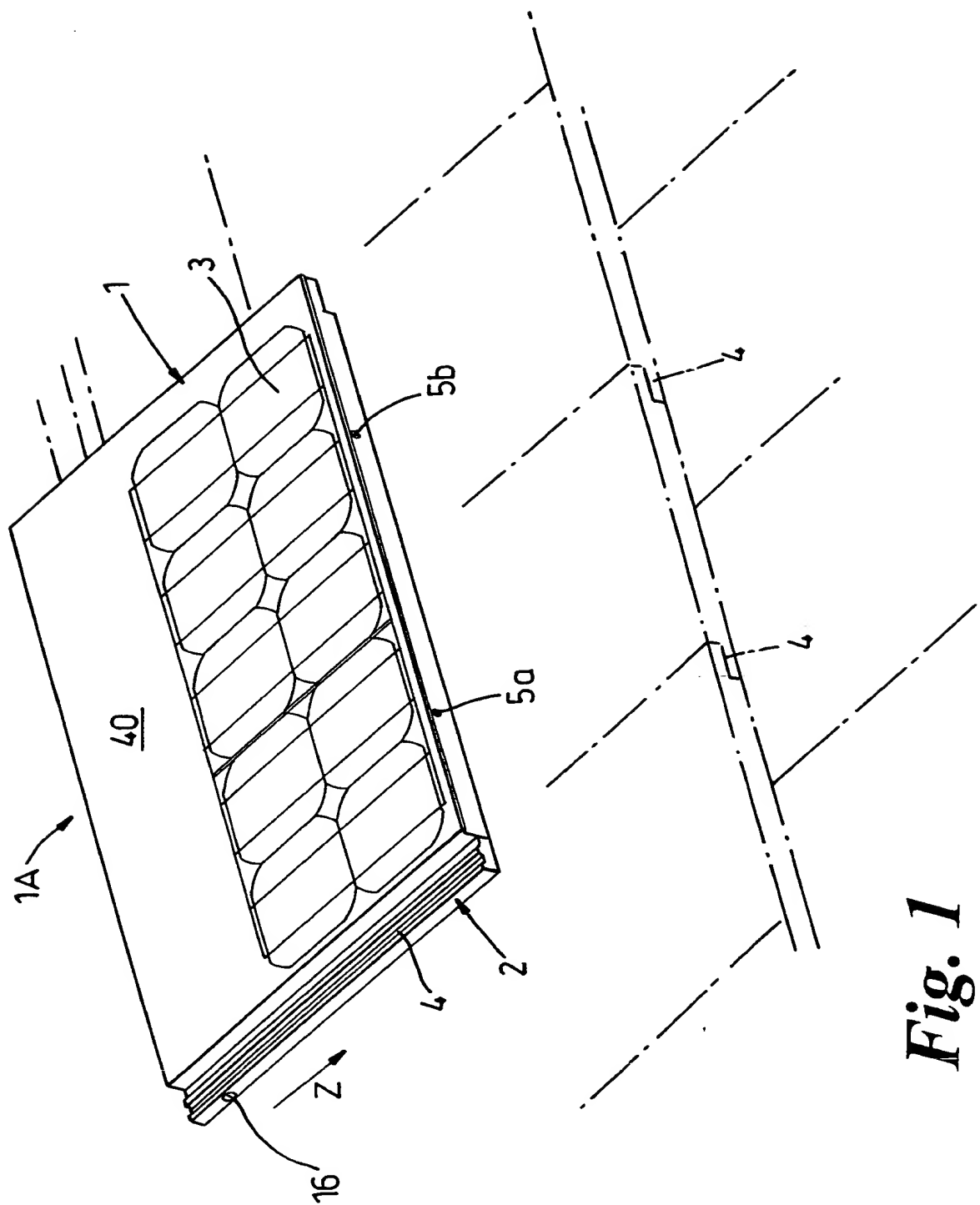
13. A solar tile assembly as claimed in claim 12, wherein the means  
5 for providing electrical connections between adjacent solar tile assemblies comprises an electrical connector on opposite sides of the support structure.

14. A removable solar tile comprising photovoltaic means and an electrical connector, the arrangement being such that in use an electrical  
10 connection between the electrical connector of the removable solar tile and a second electrical connector of an inner support structure is achieved by bringing together the outer panel and the inner support structure.

15. An inner support structure for a removable tile that comprises  
15 photovoltaic means, the inner support structure comprising an electrical connector, the arrangement being such that in use an electrical connection between the electrical connector of the inner support structure and an electrical connector of the removable tile is achieved by bringing together the removable tile and the inner support structure.

20 16. A method for providing an electrical connection for a solar tile assembly comprising a removable outer panel that comprises photovoltaic means and a first electrical connector, and an inner support structure that comprises a second electrical connector, the method comprising sliding the outer panel towards the inner support structure in a direction  
25 substantially parallel to the plain of the outer panel until the first electrical connector contacts the second electrical connector.

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*Fig. 1*



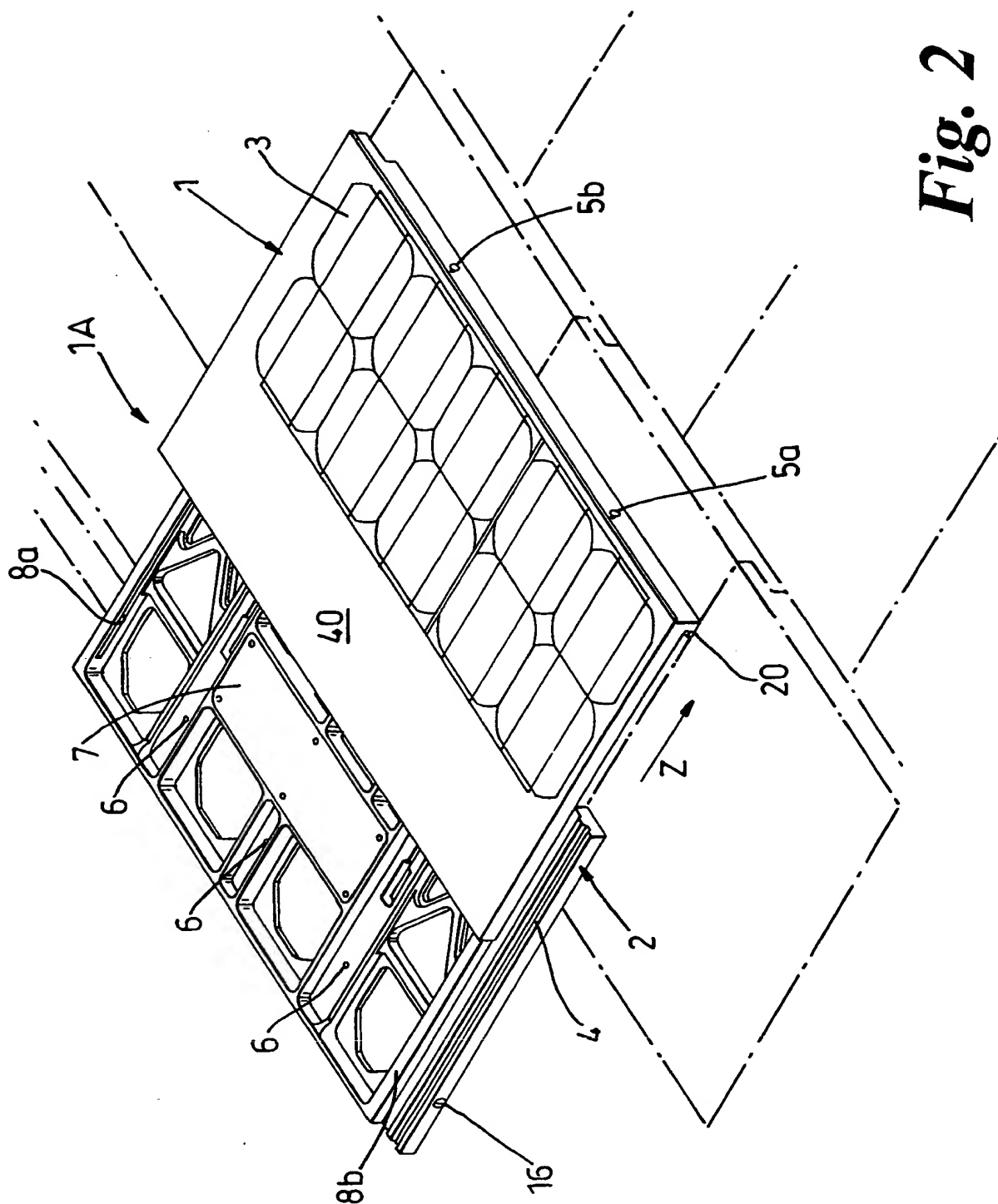
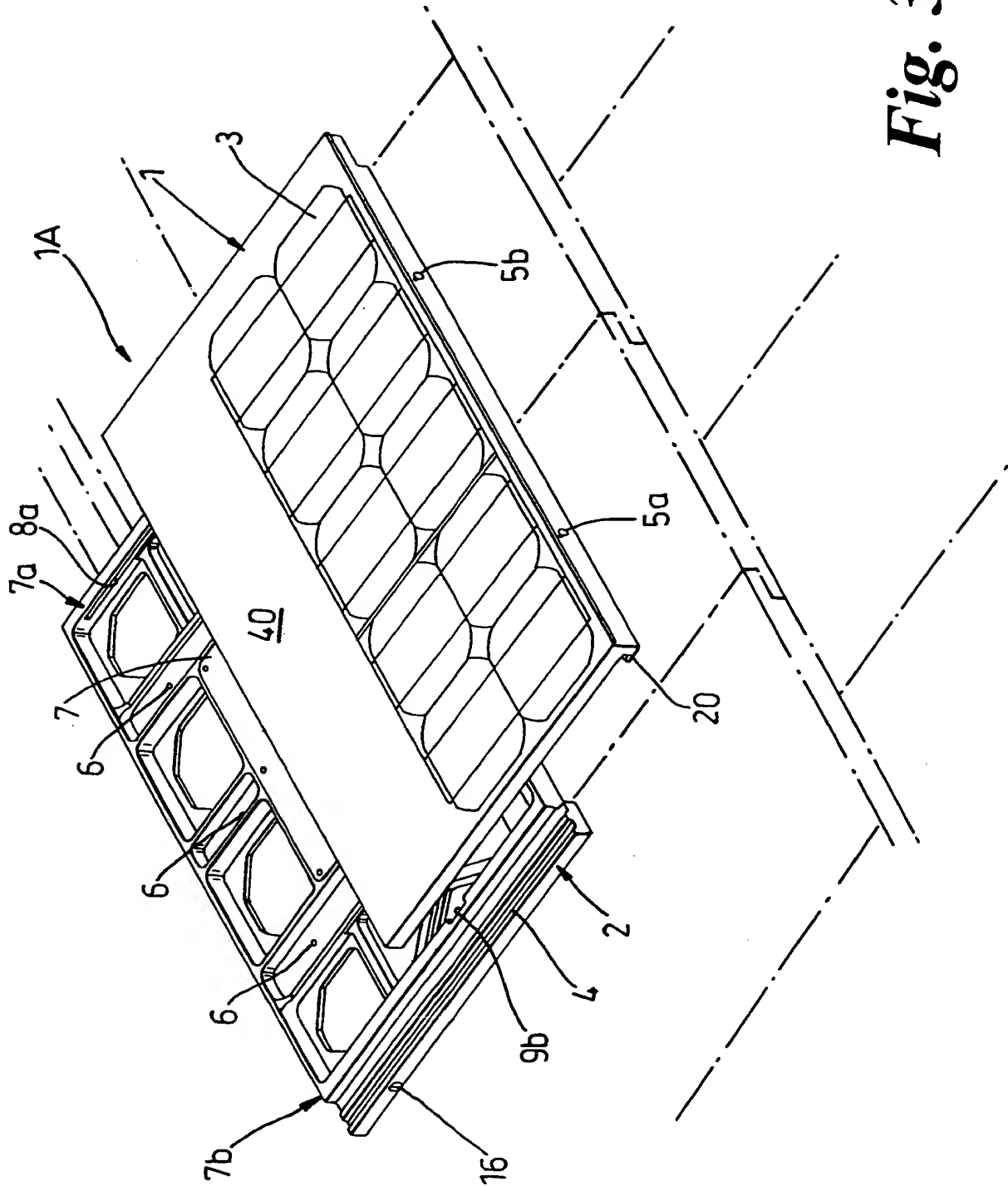


Fig. 2

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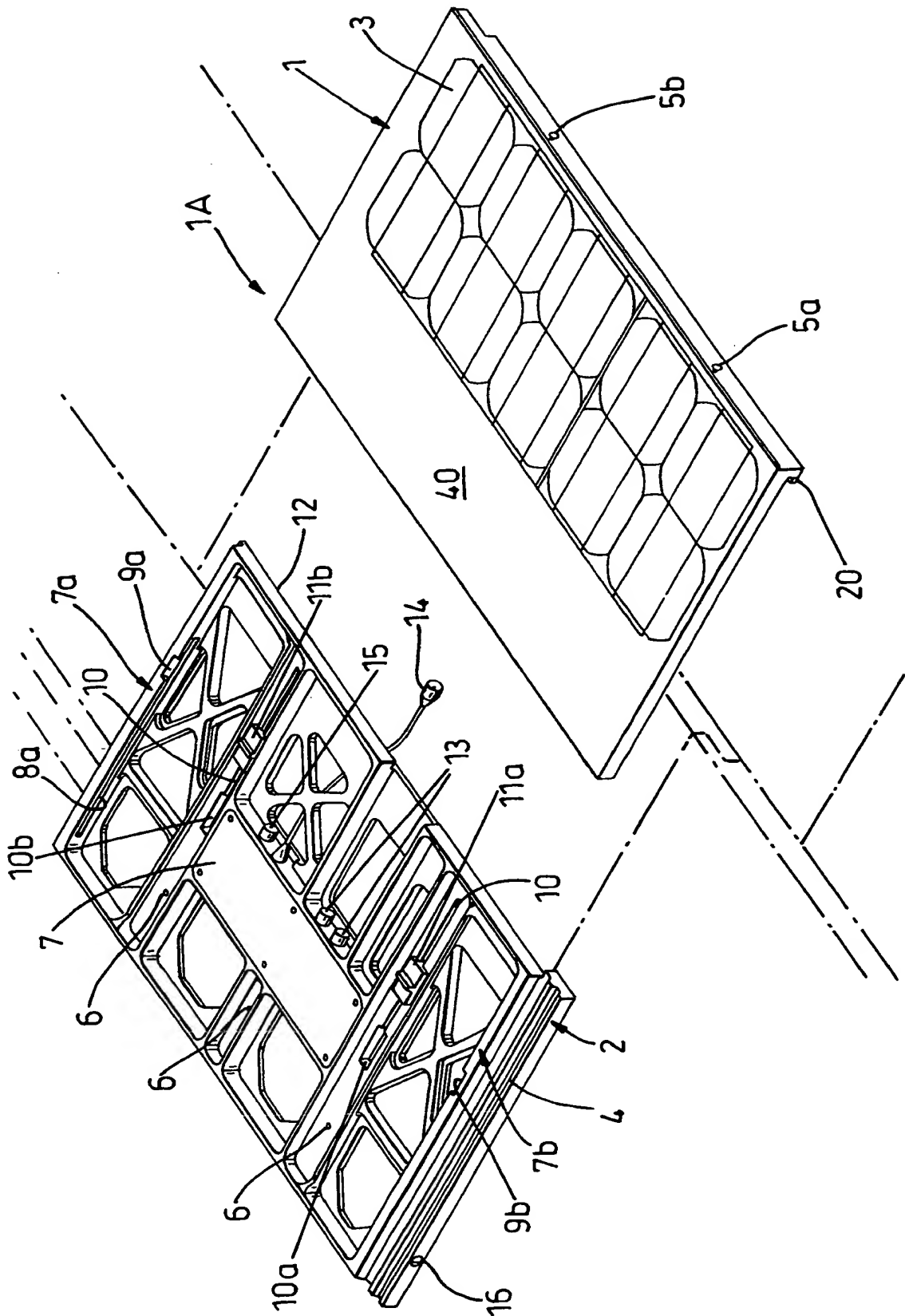


Fig. 4

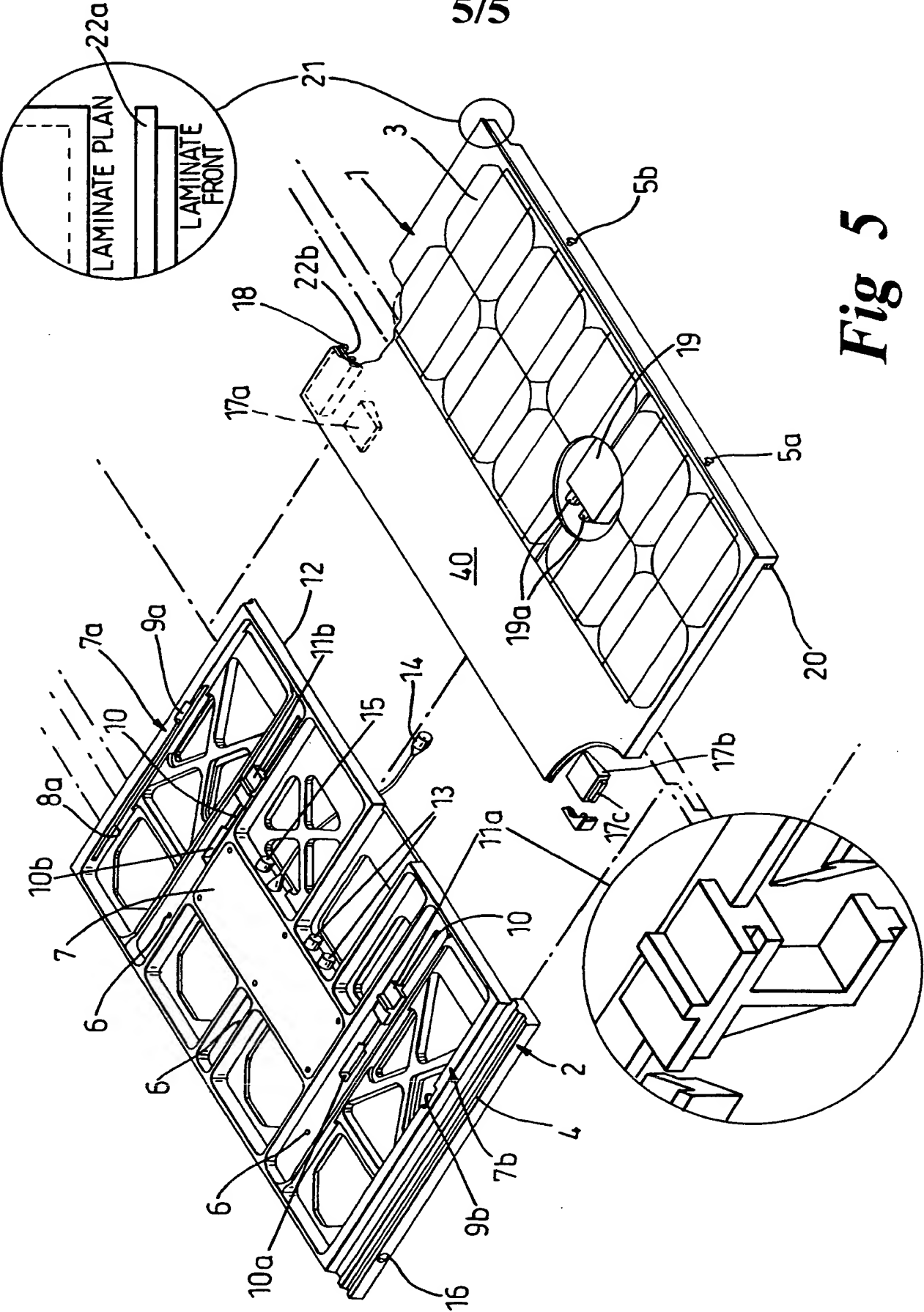


Fig 5

(19) World Intellectual Property Organization  
International Bureau



(43) International Publication Date  
21 December 2000 (21.12.2000)

PCT

(10) International Publication Number  
WO 00/77860 A3

(51) International Patent Classification<sup>7</sup>: H01L 31/048

(21) International Application Number: PCT/GB00/02159

(22) International Filing Date: 14 June 2000 (14.06.2000)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:  
9913705.1 14 June 1999 (14.06.1999) GB

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(81) Designated States (*national*): AE, AG, AL, AM, AT, AU,  
AZ, BA, BB, BG, BR, BY, CA, CH, CN, CR, CU, CZ, DE,  
DK, DM, DZ, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU,  
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NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR,  
TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW.

(84) Designated States (*regional*): ARIPO patent (GH, GM,  
KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW), Eurasian  
patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European  
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IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG,  
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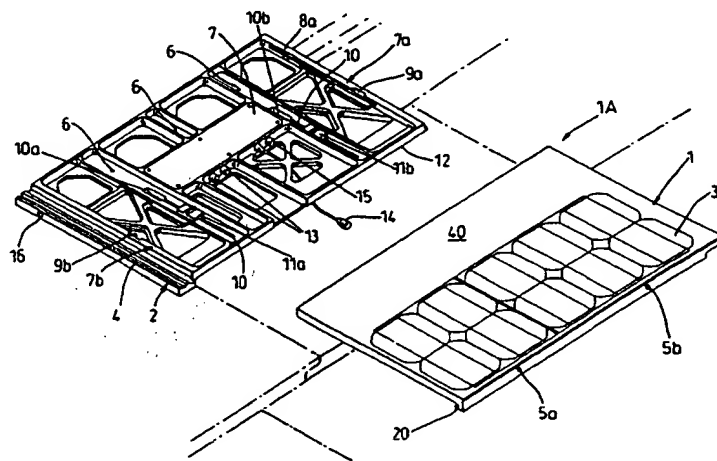
Published:

— With international search report.

(88) Date of publication of the international search report:  
22 February 2001

[Continued on next page]

(54) Title: SOLAR TILE ASSEMBLY



(57) Abstract: A solar tile assembly (1A) comprises a removable rectangular outer panel (1) that comprises a first electrical connection and ten photovoltaic cells (3) disposed on the outermost surface thereof, and a substantially rectangular inner support structure (2) that comprises a second electrical connection. The arrangement is such that in use an electrical connection between the first and second connections is achieved by bringing together the outer panel and the inner support structure. The photovoltaic cells (3) cover the lower portion of the outer panel (1). Any suitable photovoltaic means may be used for the solar tile assembly. The outer panel (1) is secured to the inner support structure (2) using two fasteners (5a, 5b) disposed at the front end of the solar tile assembly (1A). The fasteners (5a, 5b) may typically be quarter or half turn captive fasteners. These types of fasteners have the added advantage of being retained by the outer panel (1) during assembly/disassembly processes. The inner support structure (2) comprises a framework at one end of which there is formed a lower stepped interlockable section (4). In use the interlockable section (4) is disposed under a portion of an adjacent tile assembly, as is well known in the art of roof tile design.



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## A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 H01L31/048

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 H01L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

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A	paragraphs '0024!-'0035! ---	11, 13
X	JP 10 088740 A (SEKISUI CHEM CO LTD) 7 April 1998 (1998-04-07) paragraphs '0012!-'0016! ---	1,2,8, 12, 14, 15
A	PATENT ABSTRACTS OF JAPAN vol. 015, no. 151 (M-1103), 16 April 1991 (1991-04-16) & JP 03 025146 A (SANYO ELECTRIC CO LTD), 1 February 1991 (1991-02-01) abstract --- -/--	1-4, 6, 7, 12, 14-16



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Patent family members are listed in annex.

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Date of the actual completion of the international search

15 September 2000

Date of mailing of the international search report

22/09/2000

Name and mailing address of the ISA

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# INTERNATIONAL SEARCH REPORT

Inter. Appl. Application No

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## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

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information on patent family members

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## CLAIMS

1. A solar tile assembly comprising a removable outer panel (1) that comprises photovoltaic means (3) and a first electrical connector (19a), and an inner support structure (2) that comprises a second electrical connector (13), the arrangement being such that in use an electrical connection between the first electrical connector (19a) and the second electrical connector (13) is achieved by bringing together the outer panel (1) and the inner support structure (2).
2. A solar tile assembly as claimed in claim 1, wherein the electrical connection between the first electrical connector and the second electrical connector is broken by the removal of the outer panel from the inner support structure.
3. A solar tile assembly as claimed in claim 1 or claim 2, wherein the outer panel is slidably attached to the inner support structure by attachment means comprising a channel section (10) formed to receive an attachment element (17a, 17b).
4. A solar tile assembly as claimed in claim 3, wherein the outer panel (2) comprises the attachment element (17a, 17b) and the inner support structure is formed with the channel (10) for receiving and retaining the attachment element of the outer panel.
5. A solar tile assembly as claimed in claim 3, wherein the outer panel comprises a pair of attachment elements (17a, 17b) and the inner support structure is formed with a pair of channels (10) for receiving and retaining the attachment elements of the outer panel.

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6. A solar tile assembly as claimed in claim 1, wherein the electrical connection between the first electrical connector and the second electrical connector is broken by sliding the outer panel in a direction that is substantially parallel to plane of outermost surface of the outer panel.
- 5 7. A solar tile assembly as claimed in any one of claims 1 to 6, wherein the outer panel is removed from the inner support structure by first sliding the outer panel in a direction that is substantially parallel to plane of the outermost surface of the outer panel and then lifting the outer panel in a direction perpendicular to the direction of the slide direction.
- 10 8. A solar tile assembly as claimed in any one of the preceding claims, wherein, in use, the inner support structure can be attached to the outer surface of a structure such as a building or attached to an independent support structure inside or outside a building.
- 15 9. A solar tile assembly as claimed in any one of the preceding claims, wherein the inner support structure comprises an electrical junction box (7) that comprises the second electrical connector (13).
- 20 10. A solar tile assembly as claimed in claim 9, wherein the electrical junction box of the inner support structure comprises an electrical input terminal (15) and an electrical output terminal (14), the arrangement being such that the electrical input terminal and the electrical output terminal provide electrical communication between corresponding solar tile assemblies.
- 25 11. A solar tile assembly as claimed in claim 9 or claim 10, wherein the outer panel comprises an electrical junction box formed with the first electrical connector, the arrangement being such that in the assembled

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state of the solar tile assembly the first connector and the second connector provide electrical communication between the two electrical junction boxes.

12. A solar tile assembly as claimed in any one of the preceding claims, wherein the support structure comprises means (16) for providing electrical connections between adjacent solar tile assemblies.

13. A solar tile assembly as claimed in claim 12, wherein the means for providing electrical connections between adjacent solar tile assemblies comprises an electrical connector (16) on opposite sides of the support structure.

14. A removable solar tile comprising photovoltaic means (3) and an electrical connector (19a), the arrangement being such that in use an electrical connection between the electrical connector of the removable solar tile and a second electrical connector (13) of an inner support structure (12) is achieved by bringing together the outer panel and the inner support structure.

15. An inner support structure for a removable tile that comprises photovoltaic means, the inner support structure comprising an electrical connector (13), the arrangement being such that in use an electrical connection between the electrical connector (13) of the inner support structure and an electrical connector (19a) of the removable tile (1) is achieved by bringing together the removable tile and the inner support structure.

16. A method for providing an electrical connection for a solar tile assembly comprising a removable outer panel (1) that comprises photovoltaic means (3) and a first electrical connector (19a), and an inner

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support structure (2) that comprises a second electrical connector (13),  
the method comprising sliding the outer panel towards the inner support  
structure in a direction substantially parallel to the plane of the outer  
panel until the first electrical connector (19a) contacts the second  
electrical connector (13).

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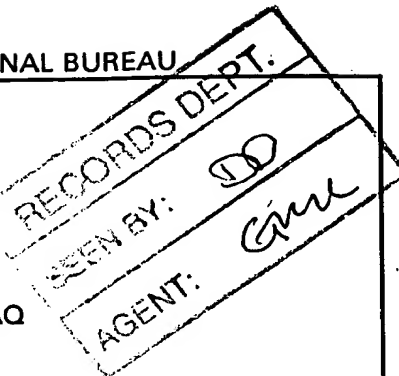
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PCT

NOTIFICATION OF THE RECORDING  
OF A CHANGE(PCT Rule 92bis.1 and  
Administrative Instructions, Section 422)

From the INTERNATIONAL BUREAU

T :

BARKER BRETTELL  
Medina Chambers  
Town Quay  
Southampton  
Hampshire SO14 2AQ  
ROYAUME-UNI

Date of mailing (day/month/year) 19 October 2000 (19.10.00)	IMPORTANT NOTIFICATION
Applicant's or agent's file reference GML2086	
International application No. PCT/GB00/02159	International filing date (day/month/year) 14 June 2000 (14.06.00)

1. The following indications appeared on record concerning:

☒ the applicant      ☐ the inventor      ☐ the agent      ☐ the common representative

Name and Address  <div style="border: 2px solid black; padding: 10px; text-align: center;"> <b>RECEIVED</b>   <b>30 OCT 2000</b>   <b>BARKER BRETTELL</b>  <b>SOUTHAMPTON</b> </div>	State of Nationality	State of Residence
	Telephone No.	
	Facsimile No.	
	Teleprinter No.	

2. The International Bureau hereby notifies the applicant that the following change has been recorded concerning:

☒ the person      ☐ the name      ☐ the address      ☐ the nationality      ☐ the residence

Name and Address <b>POWERTILE LTD</b> <b>The Old Bakery</b> <b>Parsonage Lane, Durley</b> <b>Southampton SO32 2AD</b> <b>United Kingdom</b>	State of Nationality	State of Residence
	Telephone No.	
	Facsimile No.	
	Teleprinter No.	

3. Further observations, if necessary:  
The person indicated in Box 2 has been recorded as applicant for all designated States except the US.

4. A copy of this notification has been sent to:

☒ the receiving Office      ☐ the designated Offices concerned  
☒ the International Searching Authority      ☐ the elected Offices concerned  
☐ the International Preliminary Examining Authority      ☐ other:

The International Bureau of WIPO 34, chemin des Colmbettes 1211 Geneva 20, Switzerland  Facsimile No.: (41-22) 740.14.35	Authorized officer  Anman QIU <i>Anman QIU</i>  Telephone No.: (41-22) 338.83.38
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# PATENT COOPERATION TREATY

from the  
INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY

## PCT

To:

Barker Brettell  
Medina Chambers  
Town Quay  
Southampton SO14 2AQ  
GRANDE BRETAGNE

NOTIFICATION OF TRANSMITTAL OF  
INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT

(PCT Rule 71.1)

Date of mailing  
(day/month/year)

13.09.01

Applicant's or agent's file reference

GML2086

IMPORTANT NOTIFICATION

International application No.

PCT/GB 00/02159

International filing date (day/month/year)

14/06/2000

Priority date (day/month/year)

14/06/1999

Applicant

POWERTILE LTD.

1. The applicant is hereby notified that this International Preliminary Examining Authority transmits herewith the international preliminary examination report and its annexes, if any, established on the international application.
2. A copy of the report and its annexes, if any, is being transmitted to the International Bureau for communication to all the elected Offices.
3. Where required by any of the elected Offices, the International Bureau will prepare an English translation of the report (but not of any annexes) and will transmit such translation to those Offices.
4. **REMINDER**

The applicant must enter the national phase before each elected Office by performing certain acts (filing translations and paying national fees) within 30 months from the priority date (or later in some Offices)(Article 39(1))(see also the reminder sent by the International Bureau with Form PCT/IB/301).

Where a translation of the international application must be furnished to an elected Office, that translation must contain a translation of any annexes to the international preliminary examination report. It is the applicant's responsibility to prepare and furnish such translation directly to each elected Office concerned.

For further details on the applicable time limits and requirements of the elected Offices, see Volume II of the PCT Applicant's Guide.

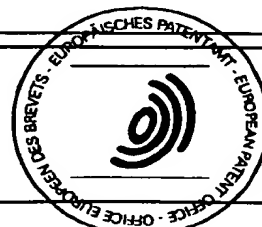
Name and mailing address of the IPEA/



European Patent Office  
D-80298 Munich  
Tel. (+49-89) 2399-0, Tx: 523656 epmu d  
Fax: (+49-89) 2399-4465

Authorized officer

S. Hopwood



# ATENT COOPERATION TREATY

# PCT

## INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference <b>GML2086</b>	<b>FOR FURTHER ACTION</b> See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. <b>PCT/GB 00/ 02159</b>	International filing date (day/month/year) <b>14/06/2000</b>	Priority date (day/month/year) <b>14/06/1999</b>
International Patent Classification (IPC) or national classification and IPC <b>H01L31/048</b>		
Applicant <b>POWERTILE LTD.</b>		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.



2. This **REPORT** consists of a total of 4 sheets, including this cover sheet.

☒ This report is also accompanied by ANNEXES, i.e., sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consists of a total of 4 sheets.

3. This report contains indications relating to the following items:

- I ☒ Basis of the report
- II ☐ Priority
- III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☒ Certain defects in the international application
- VIII ☐ Certain observations on the international application

Date of submission of the demand <b>08/01/2001</b>	Date of completion of this report
Name and mailing address of the IPEA/  European Patent Office D-80298 Munich Tel. (+49-89) 2399-0, Tx: 523656 epmu d Fax: (+49-89) 2399-4465	Authorized officer <b>F. ROUBERT</b> 



# INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.

PCT/GB00/02159

## I. Basis of the report

1. This report has been drawn up on the basis of *(Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to the report since they do not contain amendments.)*

☐ the international application as originally filed

☒ the description, pages 1-10, as originally filed  
 pages, filed with the demand  
 pages, filed with the letter of

☒ the claims, Nos. , as originally filed  
 Nos. , as amended under Article 19  
 Nos. , filed with the demand  
 Nos. 1-16, filed with the letter of 31.05.01

☒ the drawings, sheets / fig. 1/5-5/5, as originally filed  
 sheets / fig. , filed with the demand  
 sheets / fig. , filed with the letter of

2. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
- ☐ the claims, Nos.
- ☐ the drawings, sheets / fig.

3. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2 (c)).

4. Additional observations, if necessary:

**V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

**1. Statement**

Novelty	Claims	3-5, 9-11	YES
	Claims	1, 2, 6-8, 12-16	NO
Inventive Step	Claims		YES
	Claims	3-5, 9-11	NO
Industrial Applicability	Claims	1-16	YES
	Claims		NO

**2. Citations and Explanations**

Document D1: JP-A-10 088 740 (cf. Fig. 1-5 and English translation thereof) concerns a solar tile assembly (10) comprising a removable outer panel (14) that comprises photovoltaic means and a first electrical connector (plug 18), and an inner support structure (11,12) that comprises a second electrical connector (plug socket 17), the arrangement being such that in use an electrical connection between the first (18) and second (17) connectors is achieved by bringing together the outer panel (14) and the inner support structure (11,12). It is implicit from Fig. 3 that the plug (18) is engaged into the plug socket (17) simultaneously with the installation of the solar cell assembly (14) on the tile 11 since the narrow space in the concave section 13a does not allow a manual connection.

All features of Claims 1, 14, 15 and 16 are, therefore, known from D1 (Article 33(2) PCT). Furthermore, the features of dependent Claims 2, 6-8, 12 and 13 are also known from D1. The connection between plug (18) and plug socket (17) is broken by the removal of the solar panel (14) in particular by sliding it in a direction substantially parallel to the plane of the outer surface (cf. Fig. 3). The support structure (11,12) can be attached to a roof structure (cf. Fig. 3) and comprises means (16) for providing electrical connections between adjacent solar tiles assemblies (10) (cf. Fig. 3-5).

Dependent Claims 3-5, 9-11 do not contain any features which, in combination with the features of any claim to which they refer, meet the requirements of the PCT in respect of novelty and/or inventive step.

# INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.

PCT/GB00/02159

## VII. Certain defects in the international application

The following defects in the form or contents of the international application have been noted:

Contrary to the requirements of Rule 5.1(a)(ii) PCT, the relevant background art disclosed in the document D1 is not mentioned in the description, nor is this document identified therein.

## CLAIMS

1. A solar tile assembly comprising a removable outer panel (1) that comprises photovoltaic means (3) and a first electrical connector (19a), and an inner support structure (2) that comprises a second electrical  
5 connector (13), the arrangement being such that in use an electrical connection between the first electrical connector (19a) and the second electrical connector (13) is achieved by bringing together the outer panel (1) and the inner support structure (2).
2. A solar tile assembly as claimed in claim 1, wherein the electrical  
10 connection between the first electrical connector and the second electrical connector is broken by the removal of the outer panel from the inner support structure.
3. A solar tile assembly as claimed in claim 1 or claim 2, wherein the  
15 outer panel is slidably attached to the inner support structure by attachment means comprising a channel section (10) formed to receive an attachment element (17a, 17b).
4. A solar tile assembly as claimed in claim 3, wherein the outer  
panel (2) comprises the attachment element (17a, 17b) and the inner  
support structure is formed with the channel (10) for receiving and  
20 retaining the attachment element of the outer panel.
5. A solar tile assembly as claimed in claim 3, wherein the outer  
panel comprises a pair of attachment elements (17a, 17b) and the inner  
support structure is formed with a pair of channels (10) for receiving and  
retaining the attachment elements of the outer panel.

6. A solar tile assembly as claimed in claim 1, wherein the electrical connection between the first electrical connector and the second electrical connector is broken by sliding the outer panel in a direction that is substantially parallel to plane of outermost surface of the outer panel.
- 5 7. A solar tile assembly as claimed in any one of claims 1 to 6, wherein the outer panel is removed from the inner support structure by first sliding the outer panel in a direction that is substantially parallel to plane of the outermost surface of the outer panel and then lifting the  
10 direction.
8. A solar tile assembly as claimed in any one of the preceding claims, wherein, in use, the inner support structure can be attached to the outer surface of a structure such as a building or attached to an independent support structure inside or outside a building.
- 15 9. A solar tile assembly as claimed in any one of the preceding claims, wherein the inner support structure comprises an electrical junction box (7) that comprises the second electrical connector (13).
10. A solar tile assembly as claimed in claim 9, wherein the electrical junction box of the inner support structure comprises an electrical input  
20 terminal (15) and an electrical output terminal (14), the arrangement being such that the electrical input terminal and the electrical output terminal provide electrical communication between corresponding solar tile assemblies.
11. A solar tile assembly as claimed in claim 9 or claim 10, wherein  
25 the outer panel comprises an electrical junction box formed with the first electrical connector, the arrangement being such that in the assembled

state of the solar tile assembly the first connector and the second connector provide electrical communication between the two electrical junction boxes.

12. A solar tile assembly as claimed in any one of the preceding  
5 claims, wherein the support structure comprises means (16) for providing electrical connections between adjacent solar tile assemblies.

13. A solar tile assembly as claimed in claim 12, wherein the means  
for providing electrical connections between adjacent solar tile  
assemblies comprises an electrical connector (16) on opposite sides of the  
10 support structure.

14. A removable solar tile comprising photovoltaic means (3) and an  
electrical connector (19a), the arrangement being such that in use an  
electrical connection between the electrical connector of the removable  
solar tile and a second electrical connector (13) of an inner support  
15 structure (12) is achieved by bringing together the outer panel and the  
inner support structure.

15. An inner support structure for a removable tile that comprises  
photovoltaic means, the inner support structure comprising an electrical  
connector (13), the arrangement being such that in use an electrical  
20 connection between the electrical connector (13) of the inner support  
structure and an electrical connector (19a) of the removable tile (1) is  
achieved by bringing together the removable tile and the inner support  
structure.

16. A method for providing an electrical connection for a solar tile  
25 assembly comprising a removable outer panel (1) that comprises  
photovoltaic means (3) and a first electrical connector (19a), and an inner

support structure (2) that comprises a second electrical connector (13),  
the method comprising sliding the outer panel towards the inner support  
structure in a direction substantially parallel to the plane of the outer  
panel until the first electrical connector (19a) contacts the second  
5 electrical connector (13).

REC'D 17 SEP 2001

INTERNATIONAL PRELIMINARY EXAMINATION ~~REPORT~~ PCT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference <b>GML2086</b>	<b>FOR FURTHER ACTION</b> See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. <b>PCT/GB 00/ 02159</b>	International filing date (day/month/year) <b>14/06/2000</b>	Priority date (day/month/year) <b>14/06/1999</b>
International Patent Classification (IPC) or national classification and IPC <b>H01L31/048</b>		
Applicant <b>POWERTILE LTD.</b>		

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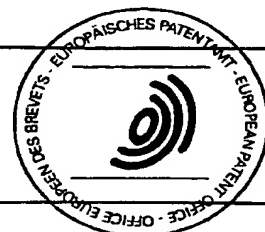
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- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☒ Certain defects in the international application
- VIII ☐ Certain observations on the international application

Date of submission of the demand <b>08/01/2001</b>	Date of completion of this report
Name and mailing address of the IPEA/  European Patent Office D-80298 Munich Tel. (+49-89) 2399-0, Tx: 523656 epmu d Fax: (+49-89) 2399-4465	Authorized officer <b>F. ROUBERT</b>





# INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.

PCT/GB00/02159

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 Nos. , as amended under Article 19  
 Nos. , filed with the demand  
 Nos. 1-16, filed with the letter of 31.05.01

☒ the drawings, sheets / fig. 1/5-5/5, as originally filed  
 sheets / fig. , filed with the demand  
 sheets / fig. , filed with the letter of

2. The amendments have resulted in the cancellation of:

☐ the description, pages:

☐ the claims, Nos.

☐ the drawings, sheets / fig.

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4. Additional observations, if necessary:

**V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

**1. Statement**

Novelty	Claims	3-5, 9-11	YES
	Claims	1, 2, 6-8, 12-16	NO
Inventive Step	Claims		YES
	Claims	3-5, 9-11	NO
Industrial Applicability	Claims	1-16	YES
	Claims		NO

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Dependent Claims 3-5, 9-11 do not contain any features which, in combination with the features of any claim to which they refer, meet the requirements of the PCT in respect of novelty and/or inventive step.